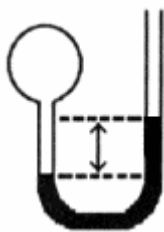


Gas Law Problems

1. A gas vessel is attached to an open-end manometer filled with a nonvolatile liquid of density 0.993 g/mL as shown below.



The difference in heights of the liquid in the two sides of the manometer is 32.3 mm when the atmospheric pressure is 765 mmHg. Given that the density of mercury is 13.6 g/mL, the pressure of the enclosed gas is _____ atm. What is this pressure in kPa?

2. A sample of gas (24.2 g) initially at 4.31 atm was compressed from 8.00 L to 2.00 L at constant temperature. What is the new pressure, after the compression?
3. A balloon originally had a volume of 4.39 L at 44.0 °C and a pressure of 729 torr. The balloon must be cooled to what temperature to reduce its volume to 3.78 L (at constant pressure).
4. A sample of He gas (2.35 mol) occupies 57.9 L at 25.0 K and 1.00 atm. The volume of this sample is _____ L at 423 K and 1.34 atm.
5. If 3.21 mol of a gas occupies 56.2 L at 34.0 °C and 793 torr, what volume will 5.29 mol of this gas occupy under these conditions.
6. A sample of gas (1.9 mol) is in a flask at 21 °C and 697 mmHg. The flask is opened and more gas is added to the flask. The new pressure is 795 mmHg and the temperature is now 26 °C. How many moles of gas are in the flask?
7. What is the density of ammonia gas (g/L) in a 4.32 L container at 837 torr and 45.0 °C?
8. A sample of a volatile alkane liquid was injected into a flask ($m_{\text{flask}} = 27.0928 \text{ g}$, $V_{\text{flask}} = 0.1040 \text{ L}$) and heated until no visible traces of the liquid could be found. The flask and its contents were then rapidly cooled and reweighed ($m_{\text{flask} + \text{vapor}} = 27.4593 \text{ g}$) The atmospheric pressure and temperature during the experiment were 0.976 atm and 18.0 °C, respectively. Which alkane was used in this experiment?

Multiple Choice (NO CALCULATOR)

1. Of the following, _____ is a greenhouse gas.

- A) O₂ D) C₂H₄
- B) CH₄ E) Xe
- C) Cl₂

2. Which of the following statements about gases is false?

- A) Gases are highly compressible.
- B) Distances between molecules of gas are very large compared to bond distances within molecules.
- C) Non-reacting gas mixtures are homogeneous.
- D) Gases expand spontaneously to fill the container they are placed in.
- E) All gases are colorless and odorless at room temperature.

3. Of the following, _____ has a slight odor of bitter almonds and is toxic.

- A) NH₃ D) CH₄
- B) N₂O E) HCN
- C) CO

4. Of the following, _____ has the odor of rotting eggs.

- A) NH₃ D) NO₂
- B) H₂S E) HCN
- C) CO

5. One significant difference between gases and liquids is that _____.

- A) a gas is made up of molecules
- B) a gas assumes the volume of its container
- C) a gas may consist of both elements and compounds
- D) gases are always mixtures
- E) All of the above answers are correct.

6. Molecular compounds of low molecular weight tend to be gases at room temperature. Which of the following is most likely not a gas at room temperature?

- A) Cl₂ D) H₂
- B) HCl E) CH₄
- C) LiCl

7. Gaseous mixtures _____.

- A) can only contain molecules
- B) are all heterogeneous
- C) can only contain isolated atoms
- D) are all homogeneous
- E) must contain both isolated atoms and molecules

8. Of the following, _____ is a valid statement of Charles' law.

A) $\frac{P}{T} = \text{constant}$

B) $\frac{V}{T} = \text{constant}$

C) $PV = \text{constant}$

D) $V = \text{constant} \times n$

E) $V = \text{constant} \times P$

9. The volume of an ideal gas is zero at _____.

- A) 0 °C D) -363 K
- B) -45 °F E) -273 °C
- C) -273 K

10. The density of _____ is 0.900 g/L at STP.

- A) CH₄ D) N₂
- B) Ne E) NO
- C) CO

11. The kinetic-molecular theory predicts that pressure rises as the temperature of a gas increases because _____.

- A) the average kinetic energy of the gas molecules decreases
- B) the gas molecules collide more frequently with the wall
- C) the gas molecules collide less frequently with the wall
- D) the gas molecules collide more energetically with the wall
- E) both the gas molecules collide more frequently with the wall and the gas molecules collide more energetically with the wall

12. Equal masses of three different ideal gases, X, Y, and Z, are mixed in a sealed rigid container. If the temperature of the system remains constant, which of the following statements about the partial pressure of gas X is correct?

- (A) It is equal to 1/3 the total pressure
- (B) It depends on the intermolecular forces of attraction between molecules of X, Y, and Z.
- (C) It depends on the relative molecular masses of X, Y, and Z.
- (D) It depends on the average distance traveled between molecular collisions.
- (E) It can be calculated with knowledge only of the volume of the container.